NATURE OF THE COAST BATHOLITH, SOUTHEASTERN ALSKA: ARE THERE ARCHEAN ANALOGS??

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Two geochemical and geochronological traverses across the 1,760-km-long and 50-150 km-wide continental margin Coast batholith (Coast Plutonic Complex in Canadian nomenclature) of southeastern Alaska and British Columbia at Skagway and Ketchikan-to-Hyder show:

(a) episodic intrusion at ca. 127Ma, 57-55Ma, 54-52Ma, 48 Ma and 32-19Ma (a minor, postsubduction event) of

(b) transversely localized and longitudinally extensive rock suites,

(c) each of which consists of part of the calcalkaline trend hornblende-biotite diorite-quartz diorite-tonalite-quartz monzodiorite-granodiorite-granite (IUGS terminology): gneissic diorite to tonalite at 127Ma, quartz diorite and tonalite at 57-55Ma, tonalite and granodiorite at 54Ma, granodiorite and granite at 54-52 Ma, granite at 48Ma and gabbro and granite at 32-19Ma; distributed so that

(d) the western part of the batholith is largely diorite to tonalite and the eastern part tonalite to granite.

All rocks show high concentrations of Sr and Ba, medium to high K and moderate light REE enrichment with small or no Eu anomalies. $^{87}Sr/^{86}Sr_i$ ratios of 0.7047-0.7066 show mild decrease with age and a larger range at higher SiO_2 contents. Five $^{143}Nd/^{144}Nd_i$ ratios are 0.51229-0.51264 and are of island-arc or immature-crustal values. Compositions at SiO_2 of ca. 55-63% are like those of Gill's average medium-K and high-K orogenic andesites. Pillowform inclusions of high-Al basalt are found in several suites and represent coeval magma derived from the underlying subduction zone.

Just west of Coast batholith, as in the region east and north of Ketchikan, intrusives of quartz diorite and tonalite are found. These are 93-89Ma old, chemically resemble Coast batholithic rocks, but show lower $^{87}Sr/^{86}Sr_i$ ratios (0.7041-0.7049), generally higher $^{143}Nd/^{144}Nd_i$ ratios (0.51246-0.51265) and lower K. These plutons may not have been emplaced in their present positions (relative to Coast batholith), but their chemical character indicates origin above a subduction zone.

Coast batholith not only formed in direct response to subduction of Pacific plates, but it is wholly bounded by accreted terranes of oceanic or slope origin. Unlike Sierra Nevada, Idaho and Peninsula Ranges batholiths, Coast batholith formed hundreds of kilometers from Precambrian crustal rocks. Its compositional trend is probably in large part a result of damp fractionation of gabbroic or dioritic magmas, with the exception that the granites may contain large crustal components.

Are analogs of Coast batholith found in the Archean? Like many Archean plutonic suites, Coast batholith formed in relatively young volcanic and sedimentary rocks. However, the abundant rocks of intermediate SiO_2 content of the western half of the batholith are not common in the Archean, whereas the abundant trondhjemitic plutons of the Archean are rare to absent in Coast batholith (except as seams formed by in-place melting of metabasalt inliers). The granites and granodiorites of Coast batholith tend to be less radiogenic than its quartz diorite and tonalite, in opposition to typical Archean occurrences. The answer, perhaps, is "no". Archean plate-tectonic processes, in producing evolved magmas different from those of Phanerozoic subduction zones, probably were unique.